25X1

The Geography of Lithuania

This is UNEVALUATED Information

25X1

A. Boundaries

The Republic of Lithuania was proclaimed in February, 1918. Boundary disputes in 1919-20 were settled by 1923 and a final determination of the frontiers located the country between approximately 53° 50'N and 56° 30'N latitudes and 21° 00'E and 26° 20'E longitudes. [Sketch #1, "Political Map of Lithuania", see end of report for availability.](1)

B. Latitude and Its Effect on Climate

Summer daylight hours are long because of the high latitude, compensating in part for the short growing season (170-200 days).(2) In Birzai (approximately 56° 25'N) and Sventoji (approximately 56° 00'N), daylight and twilight last almost 24 hours a day at the time of the summer solstice.(3) The following chart comparing the relative time of sunrise and sunset in Vilno [Vilnius] (approximately 54° 45'N) and Chicago, Illinois (approximately 41° 45'N) illustrates the effect of high latitude on Lithuania:

Place	Time	18 March		23 June		23 Sep		23 Dec	
		Time	Duration of Daylight	Time	Duration of Daylight	Time	Duration of Daylight	Time	Duration of Daylight
Vilno (Time as of 1904)	Sunrise	06:09	11 hrs 58 min	03:28	17 hrs 07 min	05:49	12 hrs 08 min	08:26	6 hrs 56 min
	Sunset	1807		2035		1757		1532	
		21 March		21 June		23 Sep		22 Dec	
Chicago (CST)	Sunrise	0602	12 hrs 11 min	0429	15 hrs 05 min	0548	12 hrs 08 min	0720	9 hrs 16 min
	Sunset	1813		1934		1756		1636	

(4)

Lithuania's latitude is approximately the same as that of the Labrador Peninsula. The latter has a severely cold climate, however, while Lithuania's climate is milder due to the tempering effect of the warm Gulf Stream and of warm Atlantic air masses. The forest vegetation of Lithuania does not vary within the country due to differences in latitude and longitude. In general, for comparative purposes, Lithuania is most like Northern Michigan and Northern Wisconsin in surface, soil, climate, and vegetation.

C. Landforms, Topography and Soil

1. Almost all of Lithuania (as of 1938) was included within the basin of the Nemunas (Neman) River. The area of Lithuania then was 52,820 sq km and the autonomous District of Klaipeda totalled 21,850 sq km, a total of 55,670 sq km or 21,494 mi.(5) By way of comparison, the area of the State of West Virginia is 24,181 sq mi. As of 1938, approximately 75% of the area of Lithuania was farmland, 17% forests, 6% lakes and rivers, and 2% unproductive wasteland.(6)

2. Approximately two-thirds of Lithuania is a plain. Average height of the country above sea level is about 150 meters.(7) The surface has been glaciated at least twice, the last time only over the northern portions of the country making it the younger part, geologically speaking. In some places the newer deposits overlying the old moraine are more than 100 meters thick. Glacial (moraine) deposits cover about 90% of Lithuania. Glacial action shaped two upland regions, one in the east and the other in the west. /Sketch #2, "Physiographic Map of Lithuania", see end of report for availability./ The eastern upland rises above 280 meters at several points in Vilkaviskis County while in places the western upland rises above 230 meters.(8) Both upland regions have terminal moraines and fairly steep hills in their central portions which become less rugged and smoother toward the edges. A central plain which is generally level but includes some hilly strips lies between the two uplands.(9)

3. The soil of Lithuania lies within the general specifications for the gray-brown podzols. /Sketch #3, "Europe Soils", see end of report for availability./ This soil corresponds to that found in Upper Michigan, northern Wisconsin, and the southern portion of central Canada.(10) Most of the rock (material from earlier geologic periods) is from the Diluvial Era and forms a moraine loam of rounded stones and rock chips.(11) This loam is rich in calcium ($CaCO_3$) in the form of limestone and its residue, and in magnesium carbonate ($MgCo_3$). The rock is of volcanic and sedimentary origin and is usually of small size. Stones over 60 cu ft are rare. Where the moraine loam has been exposed to water erosion, various types of soil have been deposited depending on the water velocity. These include heavy clays, light clays; heavy, medium, and light loams; loamy sands, regular sands, and silty clays. Generally, all of these soils contain calcium; the gravels (in the presence of limestone) up to 75%, the clays 10-20%, and the sands just a small percentage.(12)

4. The uplands are composed mainly of light materials of a sandy character (sandy loams and gravels). The plains are largely composed of clays and loams, and in the south there are large areas of swampy, sandy soils. The soils in the north are of a dark brown color. They are younger and have not been leached as much as the lighter colored soils in the south. About 25% of the soils are sands and are found mostly in pine forests.

5. It is possible to divide Lithuania into three parts according to soil types:

   a. North-west (western upland) - loam and loamy sands with marshy podsols and a medium-to-strong podsol process;

   b. Central (plain) - loams and clays, old soils rich in carbonates - the best, most fertile soils in Lithuania with a very slight podsol process;

   c. South-east (eastern upland) - loamy sands, sandy, and light loamy soils -- medium podsol process.(13)

6. Originally, the pine forests of Lithuania were located on the sandy soils of the two upland regions and the deciduous and Norway Spruce forests grew in the heavy loams and clays of the plains. The upland soil generally has less calcium than the plains' soils which contain up to 12% calcium. Humus soils are found in the swampy forests and swamps. The forest litter (leaves, etc) decomposes readily. The soils of the coniferous forests have a concentration of P_H = 3.5 - 4.0. The deciduous forests growing in the calcium-rich soils react neutrally, P_H = 5-6.(14) The best places for forest growth are those where drainage is best and where the soils are sandy, loamy sands, or loam.

7. Both upland regions are well drained because of the velocity of the creeks and rivers and because the sandy soil is transported readily by the water. The ground-water level of the uplands lies 3-20 meters deep. Most wells (not artesian) in these areas are dug to these depths. The good drainage and ready water supply of the uplands made them most desirable for human habitation and they were settled before the plains, except for the areas

of Marijampole and Vilkaviskis. Roads in the area are good. Drainage in the plains is poor because of the heavier soils. Ground-water level is high and often reaches the surface after heavy rains or spring thaws. When this occurs, the plains and their forests are very difficult to cross. The roads, even when maintained, are not very good and are not of use over long periods of time. The river network of Lithuania is insufficient for the country's need.(15) River distribution is not uniform and the fall is insufficient overall. This is particularly true in the northern portion of the country and Kamana, Tyrulis, Rekijavas, and Zuvintas are well-known swamps and peat bogs.

D. Climate

1. In general, Lithuania lies in the European northern moderate zone and has a moist, continental climate with a warm summer and cold winter.(16) Precipitation is moderate in all seasons with a summer maximum. /Sketch #4, "Europe: Climatic Regions", see end of report for availability./ The climate is similar to that found in the Great Lakes and New England Regions of North America. Lithuania lies at the juncture of the continental climate of the Russian plain, and the marine temperate climate of the Atlantic regions. Its climate is tempered by the warm Gulf Stream. Because of its location between these two climatic regions, Lithuania has unstable weather, subject to frequent changes and very difficult to predict. The climate is chiefly influenced by the Atlantic air masses in the form of a series of cyclones which form in the moderate latitudes of the Atlantic and move eastward across Lithuania. The extreme winter cold of the Asian land mass causes a high pressure area (approximately 770 mm) from which cold air masses move southwest, west, and northwest and cross Lithuania. In January air pressure in Lithuania is about 763 mm and isobars run vertically. /Sketch #5, "Atmospheric Pressure and Wind", see end of report for availability./ For this reason, prevailing winds in January blow from the land towards the southwest. In the summer (July) a high is formed in the Atlantic Ocean and winds blow from the ocean toward the east and northeast. Mean isobars (759 mm) in July run northwest-southeast.(17) In spring and fall the climate is a typical continental type.(18) The influence of the Baltic Sea is negligible, affecting Lithuania only about 50 km inland.(19) The influence of the Gulf Stream is less important than the barometric differences.(20)

2. The mean annual temperature of Lithuania is about /6°C (according to observations made from 1931-40, it is /6.4°C).(21) /Sketch #6, "Mean Temperature", see end of report for availability./ The coldest month is January (-4.8°C). The hottest month is July with a mean temperature of /17.2°C (1931-40 observations recorded means temperatures for January of -5.2°C and for July of /18.2°C).(22) The mean annual amplitude is 23.8°C at Zarasai /approximately 55° 45'N - 26° 15'E/ and 19.1°C at Klaipeda /approximately 55° 45'N - 21° 10'E/. Lithuania is progressively hotter in summer and colder in winter as one moves eastward. Annual mean amplitude is also greater in the east because of the influence of the climate. The growing season (temperatures above /5°C) differs according to latitude and longitude. On the shores of the Baltic it is 169 days, around Kaunas /approximately 55° 50'N - 23° 55'E/ 199 days, and around Kibartai /approximately 54° 40'N - 22° 45'E/ 202 days.(23) Winter (below 0°C) lasts three and one half months on the Baltic Coast, four months in the center of the country, and four and one half months in the eastern part of the country. Spring (0°C - 15°C) lasts two and one half months on the Baltic Coast and two months in the east. Summer (over 15°C) and fall (15°C) last about three months over all the country. The beginning and end of the seasons do not vary more than two weeks throughout Lithuania.(24)

3. When the influence of the continental high is strongest, summers are hot and dry and winters are cold, with an accumulated snow cover up to 50 cm by the end of the winter season. The hottest days of the summer occur at the end of June and in early July. The first two weeks of July usually vary between 27-30°C (up to 86°F). Hot days occasionally occur in August and even in early September but the nights are much cooler during these months. The coldest temperatures of the winter are generally not lower than -20°C, but in 1929 and 1941 temperatures of -30°C and below were recorded. January is the coldest month, particularly its last two weeks.

4. During May and early June a wave of cold Arctic air often threatens orchards and the young plants of the forests. These cold air masses also occur in October. The average time of first and last frosts and the length of the growing season is:

Birzai	3 Oct - 5 May
Kaunas	13 Oct - 28 Apr
Lasdijai	Sep - 8 May(25)

The cold air mass invasions do not occur every year but are very important to the forest economy because of the damage they do to the young sprouts of the oak, the Norway Spruce, and others.

5. Temperatures below 0°C (/32°F) begin regularly in November and occasionally in October or even September. They end in March. In Kaunas this period averages 198 days (1930-1940 statistics), in Zarasai 206 days, and in Lasdijai 225 days.(26) Again, this period increases as one moves eastward from the Baltic. Icy conditions are prevalent on approximately 40% of these days.(27) Ice on lakes and rivers reaches an average thickness of about 50 cm (sometimes 60 cm) and lasts as long as the cold weather holds (longer on the lakes).(28) Open water freezes first in the NE part of the country and the freezing process progresses SW. The ice breaks up the same way, thawing first in the NE and last in the SW. The most important rivers (Nemunas, Vilija /Neris/, Sesupe) flow from East to West and are often blocked by ice from the east, causing widespread flooding. This occurs particularly at Kaunas where the Vilija joins the Nemunas. The Nemunas at Kaunas is frozen across by 20 December (on the average) and the ice breaks up by 18 March, a total of approximately 90 days. Smaller rivers and lakes usually freeze and break up earlier than the larger.(29) Ice forms on the Baltic for short periods only and only for a few hundred meters out from shore.(30) The last time the Baltic froze across was in 1712 when direct communication with Sweden was possible across the ice. During May, 1712, the ice was still thick enough on the Baltic for sleds to be used.(31)

6. The heavy clay soil in the central portions of Lithuania freezes to a depth of approximately one meter (occasionally 1.20 meters). The light sandy soils, which are better drained, freeze to a depth of about 80 cm as do the soils along the Baltic.(32) In the vicinity of Koenigsberg soil temperatures below 0°C last:

0.03	meters depth	-	127 days
0.31	" "	-	61 days
0.63	" "	-	57 days
1.25	" "	-	0 days(33)

7. Wind direction in Lithuania depends upon the high pressures of the Azores and the lows of Iceland, and on the Gulf Stream. Prevailing winds are west and northwest. Wind direction is more dependent upon barometric pressure differences than upon the Gulf Stream.(34) Changes in the wind are most extreme on the Baltic Coast and less extreme inland. Klaipeda has calm weather just 2% of the time while Vilno has calm weather for an average of three months per year (25% of the time and as much as 38% in summer).(35) Wind velocity also varies according to location, diminishing as one goes inland. The mean velocity at Klaipeda averaged 5.5 meters per second, at Riga, Latvia, 2.8 meters per second, and at Vilno 1.8 meters per second (1879-94 figures).(36) Most powerful winds occur in November, the time of cyclone formation. Mean velocity of the wind in Klaipeda during October-January is 6.3 meters per second and during May-August 4.9 meters per second. Winds are stronger during the daytime than at night. Violent storms occur at the end of hot days 10-15 times a summer and are characterized by heavy rain and thunder. Most occur during July and August which have two-thirds of all the severe storms of the year.(37) Lithuanian forests are inured to violent winds and storms and are fairly resistant to them. Only pure Norway Spruce forests suffer uprooting and then usually only when the soil is wet and the winds are very strong.

8. Tornados are very rare. They also occur only in summer after very hot days, follow a narrow path (a few km wide) and rise and disappear very quickly. They cause widespread destruction in Norway Spruce forests. Occasionally strong winter winds also cause damage in spruce forests.(38)

9. Annual precipitation in Lithuania (1926-39) was 611 mm.(39) Telsiai received 718 mm, Kaunas 600 mm, and Siauliai 547 mm per year during the period. /Sketch #7, "Precipitation 1926-1936", see end of report for availability./ Percentage distribution of precipitation by area and season is as follows:

Area	Winter	Spring	Summer	Fall
Baltic coast	20.7%	15.8%	30.3%	33.2%
Continent	16.4%	20.0%	40.5%	23.1%

(40)

During the spring when rainfall is most needed for agricultural purposes it is generally scarce. Occasionally the shortage is sufficient to cause crop failures. Forest seeding and planting is very much hurt by these spring droughts. Heaviest rainfall occurs during July and August during harvest times. August is a particularly rainy month.

10. Snow is tremendously important in Lithuania as a means of transporting heavy bulky loads (wood, etc). First snowfall occurs in October and the last snow usually disappears by April. Rarely does any remain into May. The four winter months average about the same number of snowfalls. Snow cover remains longest in the uplands. It lasts an average of 89 days per year inland and 69 days per year on the coast. Snow cover is deepest in January and February and allows the use of sled roads to transport timber from the forests to railroads and rivers. If snow cover is light and sled roads cannot be used, the timber lies in the forests and usually spoils. Ordinarily, sled roads can be used (except during thaws) from New Year's Day until the end of February, an average of three to four weeks each year. A single day of thawing weather is sometimes sufficient to ruin the snow roads. Those in the forests remain longer than those in open areas and are used to transport timber to the forest edges until the last possible moment. Generally, snow cover is 10-25 cm deep with a maximum of approximately 50 cm.

****

FOOTNOTES

(1) Mortensen, H, "Litauen", 1926, p 41

(2) Bolshaya Sovietskaya Encyclopedia, 1955, Vol 25, p 248-250

(3) Author's note

(4) Vilenskij Kalendar, 1904

(5) Bendorius, A, "Lietuva", 1953, p 17

(6) Kripas, S T, Untersungen, 1932, p 9

(7) Ibidem

(8) Musteikis, A, Z. U. Statisika, 1948, p 216

(9) Mortensen, geological map

(10) Encyclopedia Britannica, 1945, p 3-0

(11) Ruokis, V, Pietulietuvos Dirvozemiai, 1937, p 7

(12) Ibidem

(13) Bolshaya Encyclopedia, Vol 25, p 248

(14) Kripas, p 9

(15) Mortensen, p 23

(16) Encyclopedia Britannica World Atlas, 1945, p3-K

(17) Mortensen, p 5-6

(18) " " " "

(19) Bolshaya Encyclopedia, Vol 25, p 248-50

(20) Ibidem

(21) Musteikis, p 14

(22) Bolshaya Encyclopedia, Vol 25, p 248-50

(23) Ibidem

(24) Pakstas, K, Lietuvos Klimatos, 1926, p 19

(25) Musteikis, p 19

(26) Ibidem

(27) Pakstas, p 25

(28) Author's note

(29) Pakstas, p 27

(30) Ibidem

(31) Bendorus, p 38

(32) author

(33) Pakstas, p 30

(34) Ibidem, p 34

(35) Ibidem, Table 14

(36) Ibidem

(37) Ibidem, p 54

(38) Author

(39) Musteikis, p 15

(40) Ibidem